

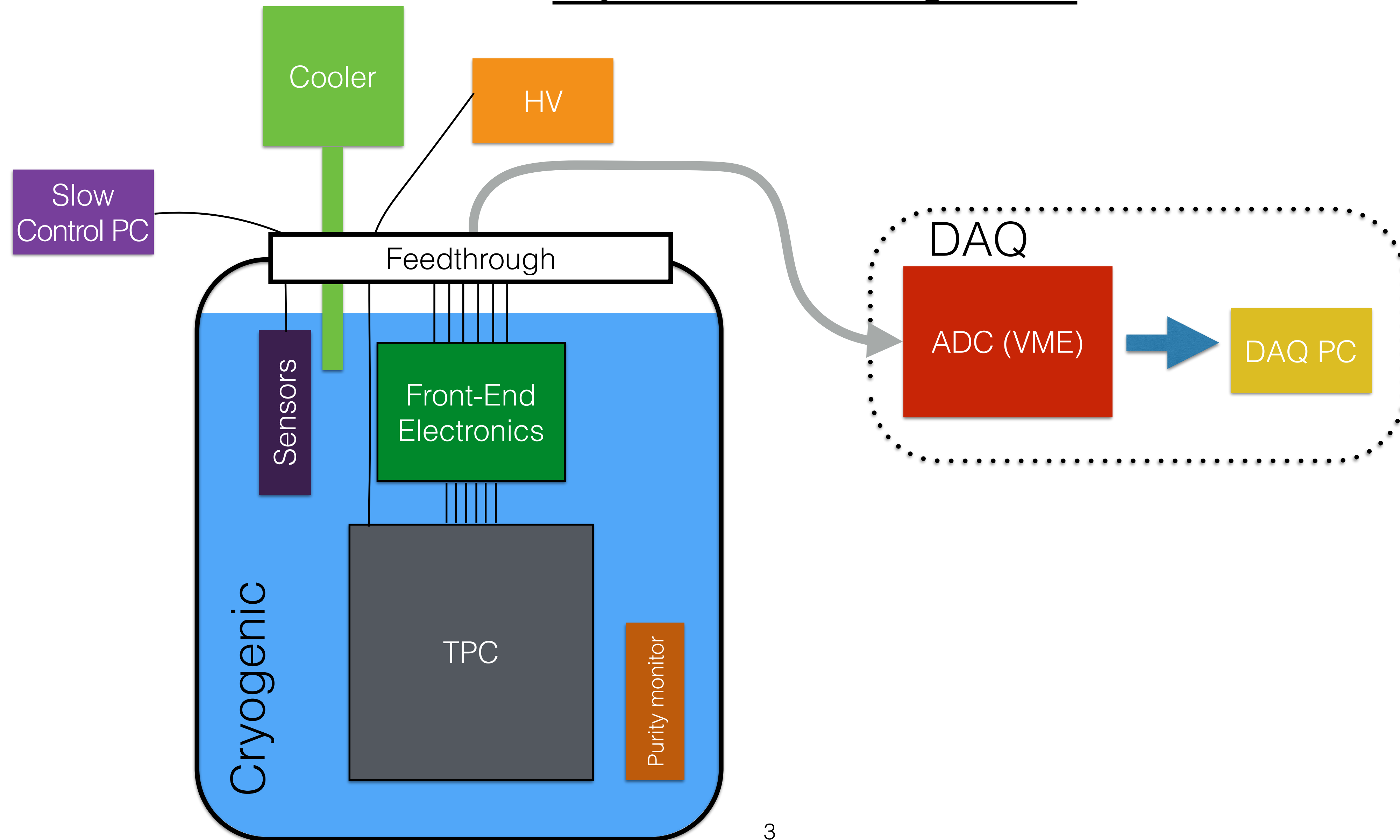
LAr Field Calibration System (LArFCS) Overview

Yichen
07/22/16

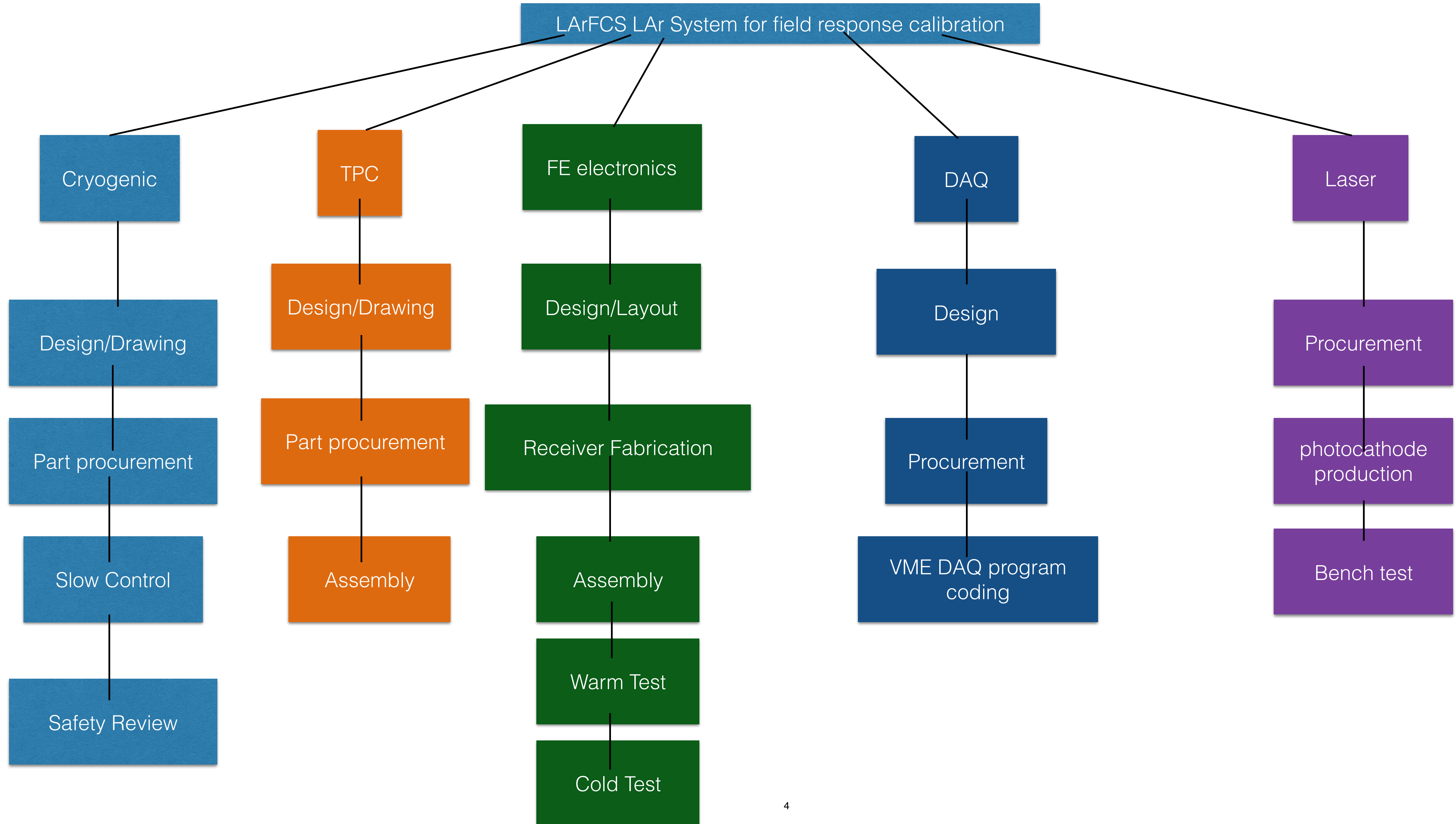
Outline

- System Diagram
- Work Structure
- Subsystems

System Diagram



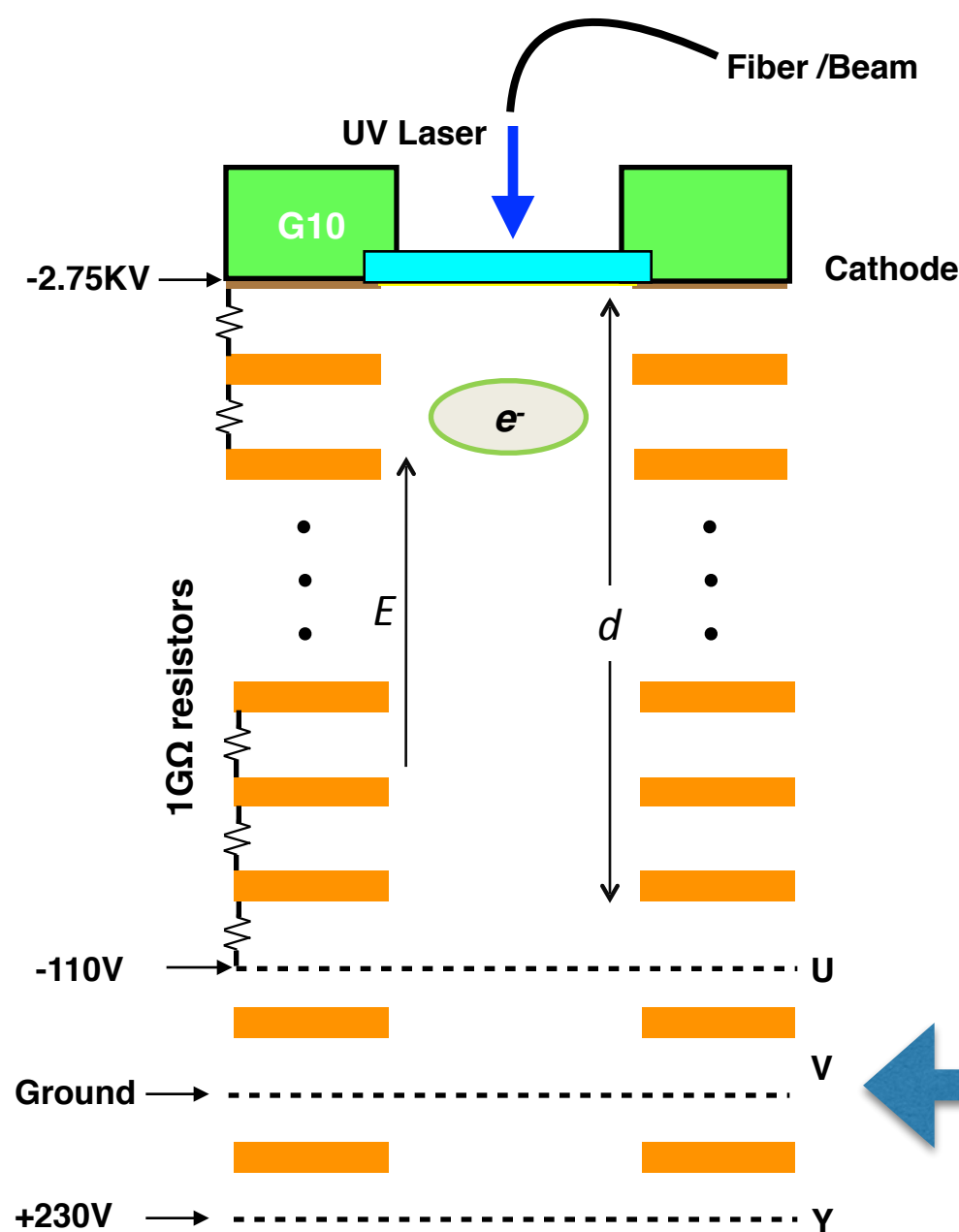
Work Breakdown Structure



Work Structure

1. The entire project can be divided into 3 tasks
2. Each individual task have clear border and can be proceeded in parallel

TPC + Cryogenic + Laser



Front-End Electronics

DAQ

Wire Carrier Board

Front-End electronics

Warm Feedthru

Wire Bias HV

Intermediate Amplifier

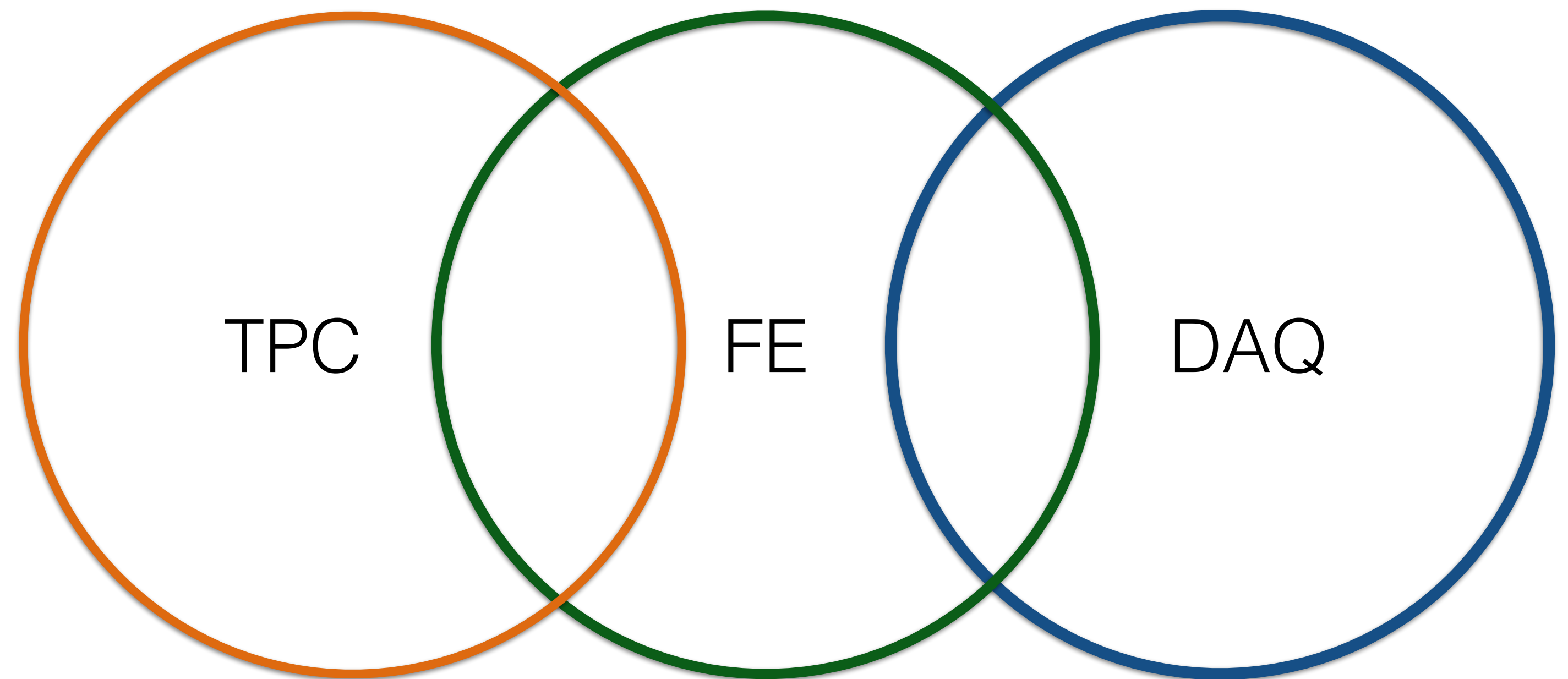
Service Board

ADC

DAQ PC

Task Forces

- TF 1: Yichen & Craig
Cryogenic Construction, TPC
Design, Laser
 - TF 2: Jyoti
Front-End Electronics
 - TF 3: Wei
DAQ construction
- UCI has agreed to collaborate
with us. Additional graduate
students are expected



Cryogenic System

1. The cryogenic system is going to be operated by the similar principle of the 20-L system
2. We have a 800-L dewar with 1-ton LAr capacity
3. The height of the dewar is 6 ft (72"), LAr with this height is corresponding a pressure of 3.65 Psi. Assuming at least we can get the similar relief pressure of 8 Psi. It is applicable to transfer LAr by pressure
4. The goal of the cryogenic system is to achieve long electron lifetime >1 ms (<1 ppb impurities)
5. See Craig's talk

42 valves

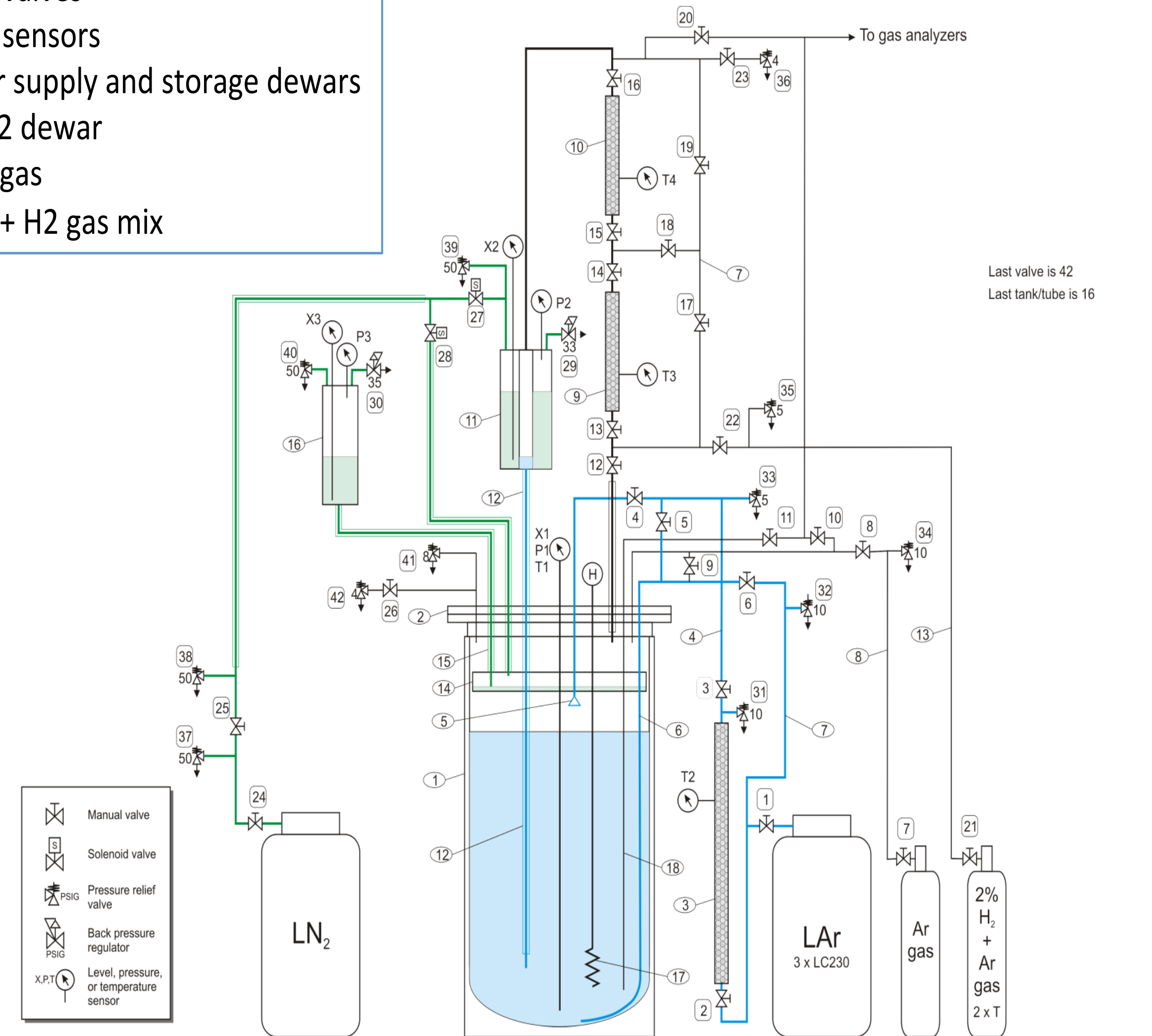
17 sensors

LAr supply and storage dewars

LN2 dewar

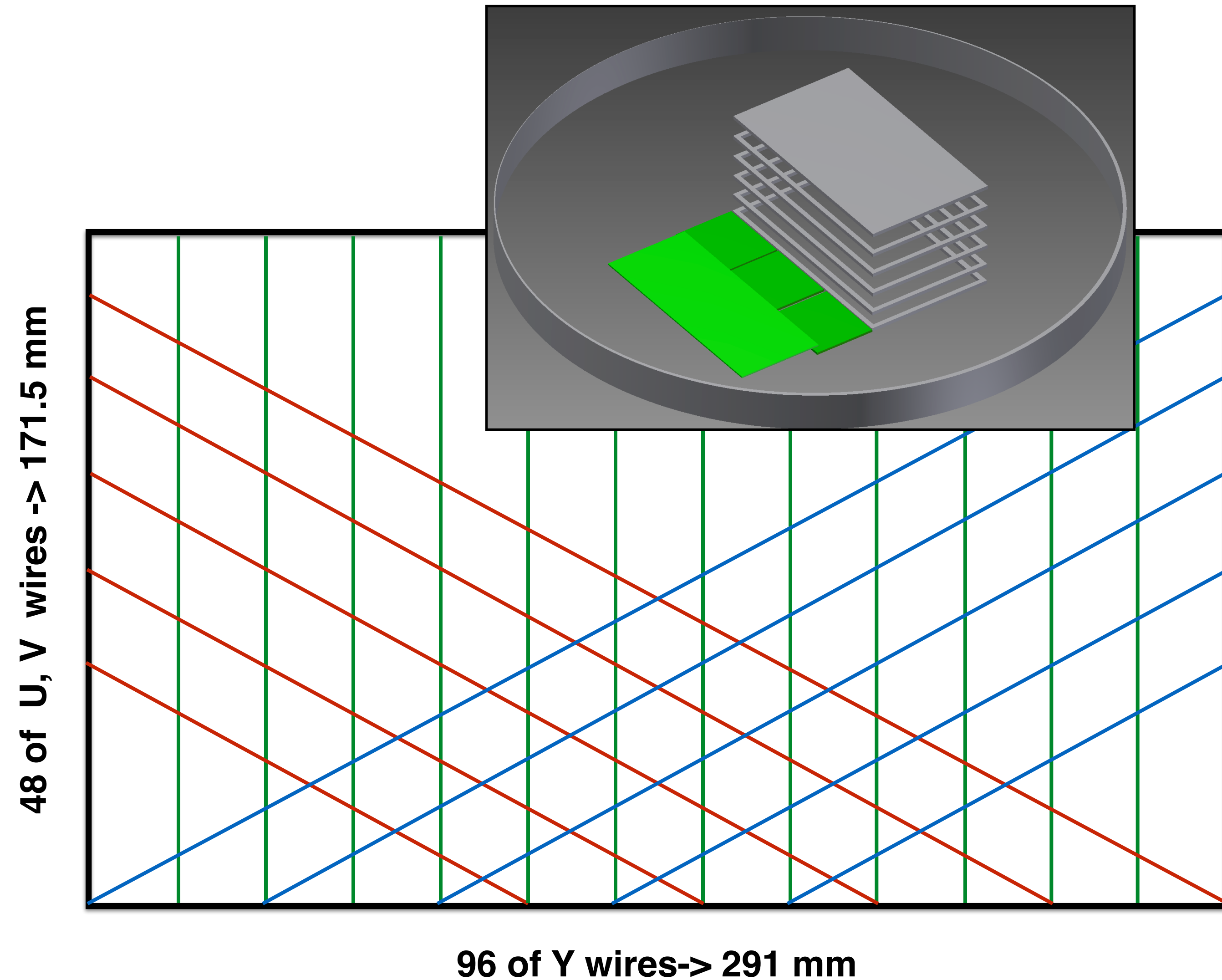
Ar gas

Ar + H₂ gas mix



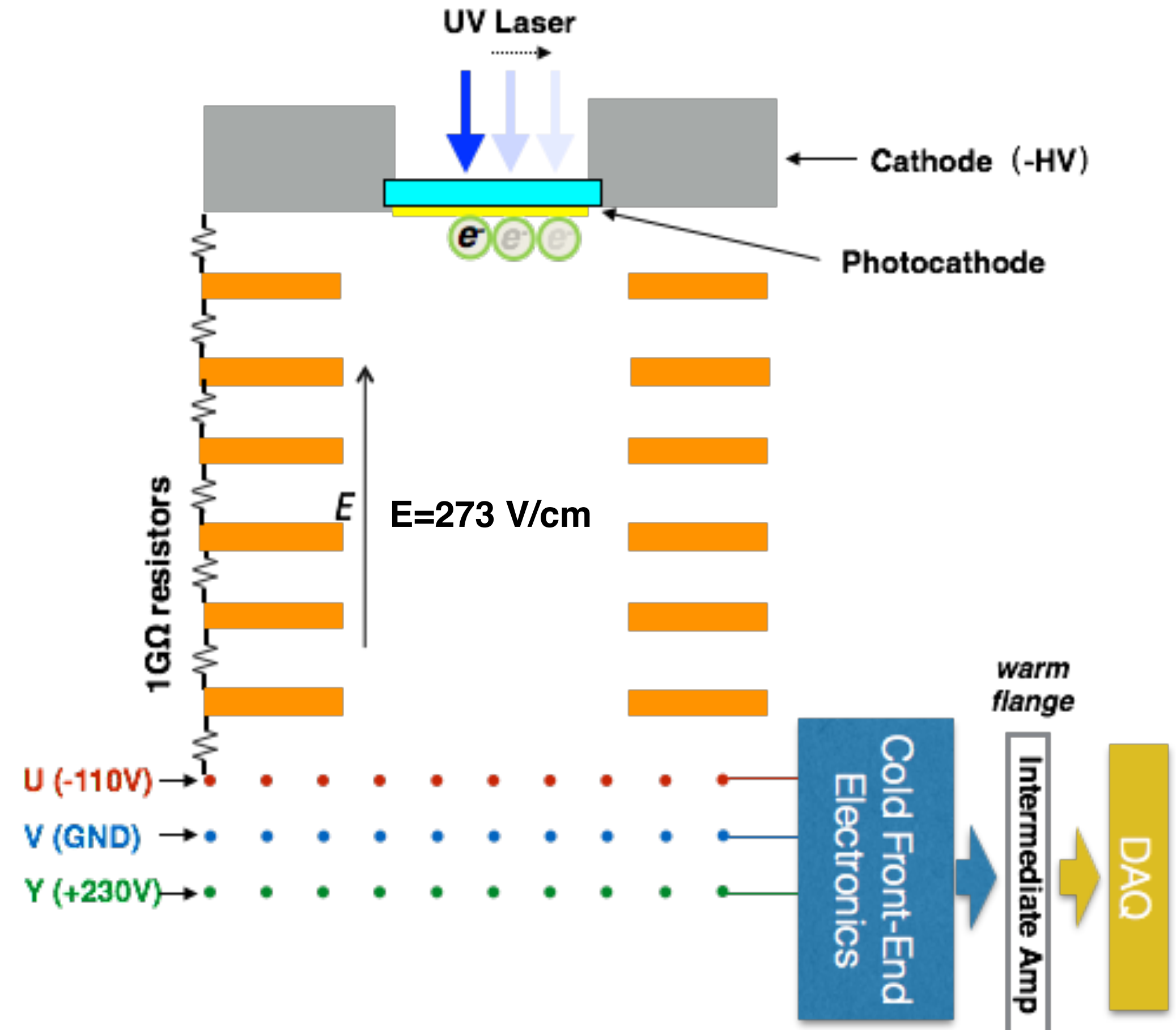
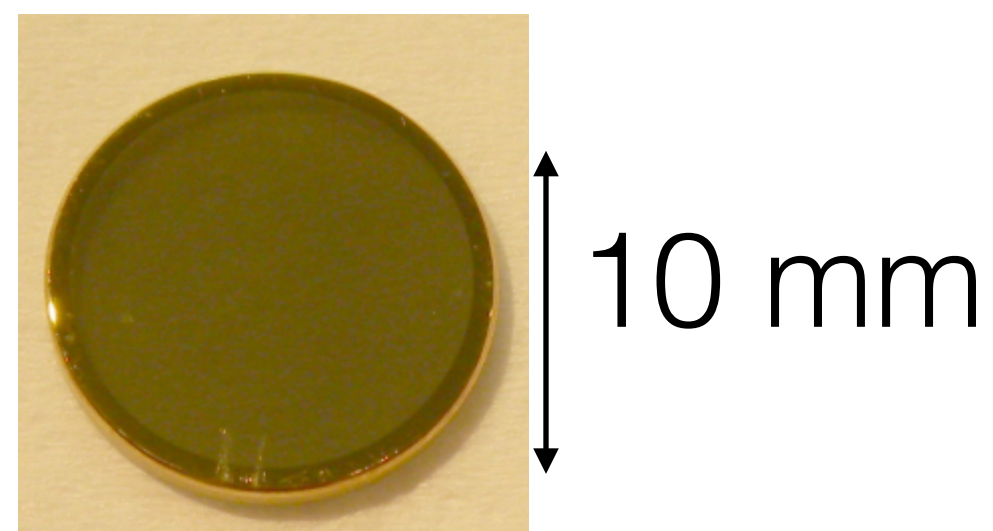
TPC Construction

1. A TPC is demanded for the measurement
2. The expected drift distance is 10 cm
3. Using rectangle field ring shape. The overall dimensions are 29.1 cm x 17.2 cm x 11 cm
4. Wire configuration:
U: 48 x V: 48 x Y: 96
5. The goal of the TPC is to generate/collect electron signal, and maintain uniform drift field
6. I will discuss the details in my talk



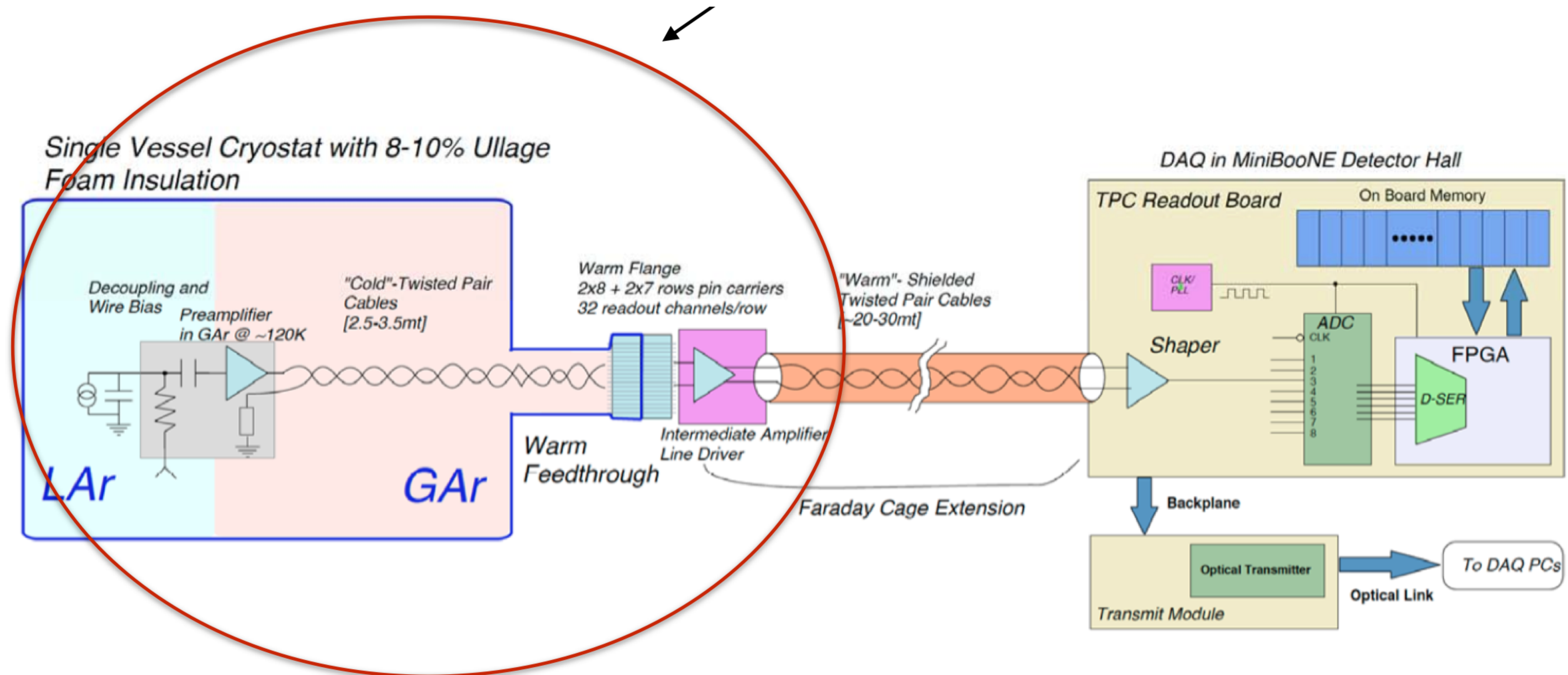
Laser

1. The electrons are planned to produce by photocathode driven by pulsed laser as in 20-L system
2. We can get a spare excimer laser from Instrumentation Division
3. The photocathode will also be supplied by Instrumentation with evacuation
4. Laser spot should have mobility



Front-End Electronics

1. We are going to duplicate the FEE of MicroBooNE with all wires implemented
2. Spare parts are available from Fermilab
3. The goal of the FEE is to establish similar functionality as MicroBooNE with low noise
4. Jyoti will show the details in her talk

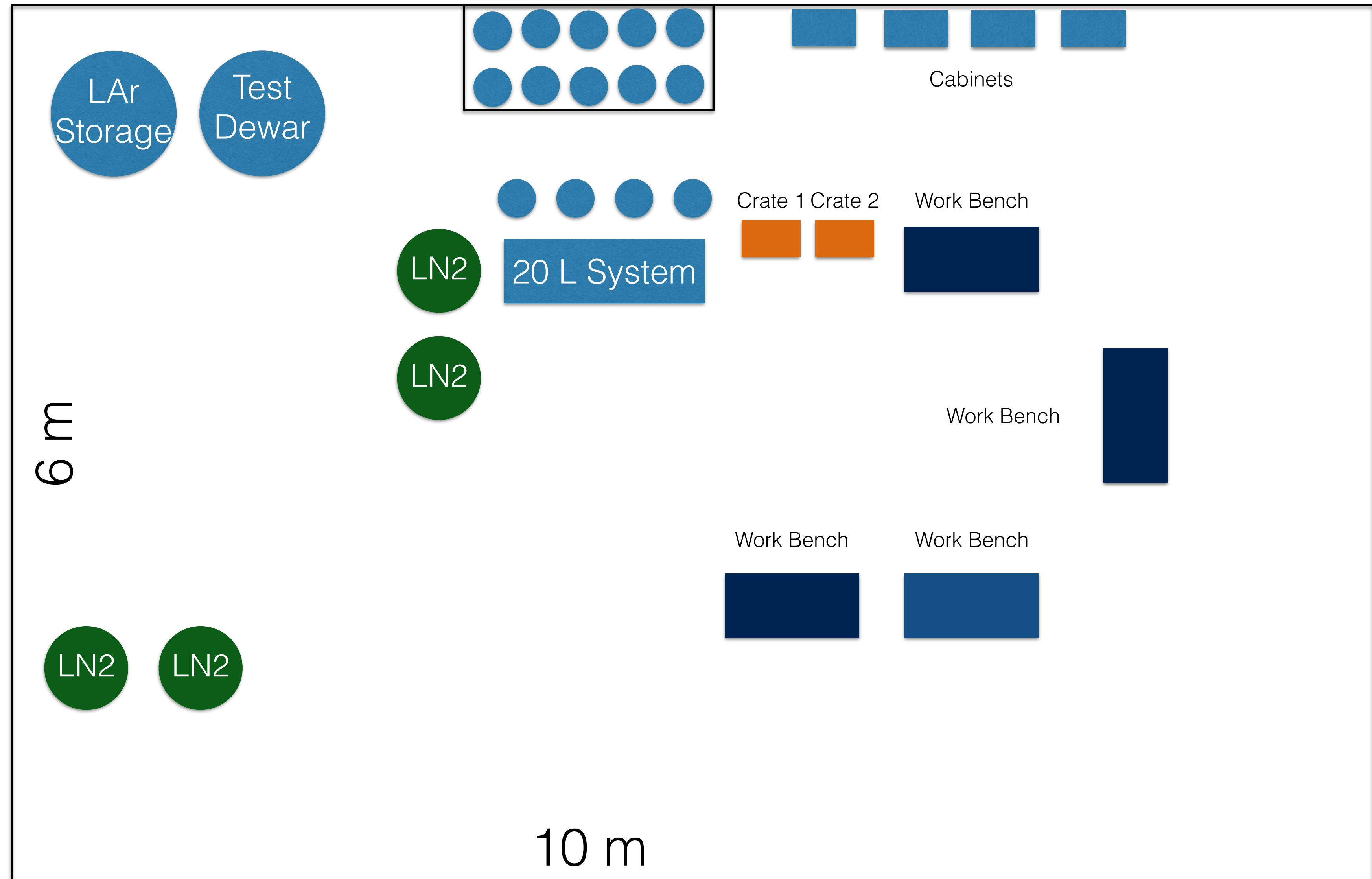


DAQ System

1. We are going to use commercial ADC for the DAQ
2. For cost/efficiency consideration, we are going to readout 96 channels
3. The goal of the DAQ system is to acquire data on laser trigger
4. Wei will cover the details in his talk

Floor Plan

1. We need to re-arrange our working area to accommodate the LArFCS system
2. The High-bay area has enough space to handle the system, ODH is not an issue
3. We are also in contact with Magnet Division for the possibility to set up our experiment in their area considering their capability of the cryogenics system



Safety Reviews

- It is crucial to ensure the fulfillment of the safety requirements by BNL
- We have discussed with Ron and determined the LArFCS system will be added to the current 20-L test stand ESR with revisions
- The laser would need a new SOP

Conclusion

- We have a clear plan for the construction of the LArFCS to conduct the direct measurement of field response function of LArTPC
- We have enough manpower to execute the plan
- There are additional requirement for safety review including both updates our current ESR and laser safety review
- The details of each subsystem will be covered in the next talks